

# SEQUENCE LISTING

<110> AKZO Nobel N.V.

<120> ;Lawsonia intracellularis vaccine

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<170> PatentIn Ver. 2.1

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<211> 656

<212> DNA

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gag cct aaa ata gaa tta gca aaa gaa gct ata tta aaa att aat gcg	144
Glu Pro Lys Ile Glu Leu Ala Lys Glu Ala Ile Leu Lys Ile Asn Ala	
35 40 45	

gca atg cct aaa atg tca tat caa ggt gga tta tat act ttt gca cct	192
Ala Met Pro Lys Met Ser Tyr Gln Gly Gly Leu Tyr Thr Phe Ala Pro	
50 55 60	

tat tct gta att att ccc caa ggt tct tgg aat tca tgt gtt gcc gaa	240
Tyr Ser Val Ile Ile Pro Gln Gly Ser Trp Asn Ser Cys Val Ala Glu	
65 70 75 80	

tgt gcg gtt aat aca att aag tct gat tta gaa att ttt ggt cgt ctt	288
Cys Ala Val Asn Thr Ile Lys Ser Asp Leu Glu Ile Phe Gly Arg Leu	
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115 120 125

tta ggg atg aat cct gtt gag gaa gta aaa tct ata tat caa aca aat 432  
Leu Gly Met Asn Pro Val Glu Glu Val Lys Ser Ile Tyr Gln Thr Asn  
130 135 140

cct aat gtt tgt ttt cat gta gtt tca ttt gca gat gat gct gaa ggc 480  
Pro Asn Val Cys Phe His Val Val Ser Phe Ala Asp Asp Ala Glu Gly  
145 150 155 160

aaa gca ata att gat caa att gtt gca ctt aat agt gga agt gtt ctt 528  
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165 170 175

gtt gat ggt tta cag ctt cta caa aat cct gct gtt tgc caa gaa ttt 576  
Val Asp Gly Leu Gln Leu Leu Gln Asn Pro Ala Val Cys Gln Glu Phe  
180 185 190

gtt aat agt gtt ttt tgt caa gag caa att ctt gtt aca gaa gaa gtt 624  
Val Asn Ser Val Phe Cys Gln Glu Gln Ile Leu Val Thr Glu Glu Val  
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35 40 45

Ala Met Pro Lys Met Ser Tyr Gln Gly Gly Leu Tyr Thr Phe Ala Pro  
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Tyr Ser Val Ile Ile Pro Gln Gly Ser Trp Asn Ser Cys Val Ala Glu  
65 70 75 80

Cys Ala Val Asn Thr Ile Lys Ser Asp Leu Glu Ile Phe Gly Arg Leu  
85 90 95

Thr Pro Val Gly Asp Gly Ile Lys Met His Glu Thr Val Ile Asn Gln  
100 105 110

Met Pro Pro Gln Ala Ala Val Ile Leu Leu Thr Asp Gly His Asn Asn  
115 120 125

Leu Gly Met Asn Pro Val Glu Glu Val Lys Ser Ile Tyr Gln Thr Asn  
130 135 140

Pro Asn Val Cys Phe His Val Val Ser Phe Ala Asp Asp Ala Glu Gly  
145 150 155 160

Lys Ala Ile Ile Asp Gln Ile Val Ala Leu Asn Ser Gly Ser Val Leu  
165 170 175

Val Asp Gly Leu Gln Leu Leu Gln Asn Pro Ala Val Cys Gln Glu Phe  
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aag ggt gtt gta ttc ttt gaa tta ggt aag act atc tgg gga cgt ggt				192
Lys Gly Val Val Phe Phe Glu Leu Gly Lys Thr Ile Trp Gly Arg Gly				
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gtt gat ggt gct tct att gga aca gat ggt aaa aat gtt ata aag ctc				240
Val Asp Gly Ala Ser Ile Gly Thr Asp Gly Lys Asn Val Ile Lys Leu				
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cgt tat tcc tat gtt gat tgg gtt att cct tac aca gat gtg caa gtc				288
Arg Tyr Ser Tyr Val Asp Trp Val Ile Pro Tyr Thr Asp Val Gln Val				
85	90	95		
cgt atg ggt tta caa cct tat gtc ctt cca gga ttt gtt gca ggt tct				336
Arg Met Gly Leu Gln Pro Tyr Val Leu Pro Gly Phe Val Ala Gly Ser				
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aca ata tta gat gct gat gga gca ggt gtt act gtt tct gct gta ttt				384
Thr Ile Leu Asp Ala Asp Gly Ala Gly Val Thr Val Ser Ala Val Phe				
115	120	125		
aat gat tat tta ggt gct aca gct ttc tgg atg cgt gca ttg cat aaa				432
Asn Asp Tyr Leu Gly Ala Thr Ala Phe Trp Met Arg Ala Leu His Lys				
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Thr Thr Leu Asp Val Val Gly Leu Thr Ile Pro Val Thr Ile Ser Asp				
165	170	175		
ata aaa att gct cca tgg ggt atg ttt gct ttt gca ggt aag aag agc				576
Ile Lys Ile Ala Pro Trp Gly Met Phe Ala Phe Ala Gly Lys Lys Ser				
180	185	190		
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Leu Leu Gly Glu Ser Tyr Gly Asp Ile Glu Asp Val Arg Ala Gly Leu				

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Val Gly Leu Ser Ala Glu Leu Ala Gly Ser Ser Pro Leu His Ile Ala			
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260	265	270	
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Val Ile Gly Asp Phe Leu Leu Asp Lys Ile Asp Leu Lys Arg Gln Gly			
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Ala Ser Lys Arg Ile Pro Thr Leu Val Gly Asn Trp Ser Ala Thr Ser			
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Phe Gly Tyr Ser Gly Ala Tyr Gly Ile Gly Lys Asp Ser Val Phe Gly			
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aat act att gct ggc tca tgg ggt gtt gta gtt cag ttg aaa gat att			1104
Asn Thr Ile Ala Gly Ser Trp Gly Val Val Val Gln Leu Lys Asp Ile			
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Gly Thr Asn Asn Lys Asp Val Pro Glu His Leu Gly Leu Ser Tyr Val			

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act acc att tat gac aca cgt ggt ggt gat aat atg ctt tac tta aca				1248
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aag aaa gat tat gct tgg gaa gta gat ttt gat act gaa tat aaa atc				1296
Lys Lys Asp Tyr Ala Trp Glu Val Asp Phe Asp Thr Glu Tyr Lys Ile				
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tat aaa gac tta agt gta gct ctt gaa ctg tca tat att cgt ctt gaa				1344
Tyr Lys Asp Leu Ser Val Ala Leu Glu Leu Ser Tyr Ile Arg Leu Glu				
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Leu Asp Lys Lys Leu Trp Asn Leu Gln Arg Glu Val Asp Lys Asn Ala				
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Lys Gly Val Val Phe Phe Glu Leu Gly Lys Thr Ile Trp Gly Arg Gly				
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Val Asp Gly Ala Ser Ile Gly Thr Asp Gly Lys Asn Val Ile Lys Leu				
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Arg Tyr Ser Tyr Val Asp Trp Val Ile Pro Tyr Thr Asp Val Gln Val				
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Arg Met Gly Leu Gln Pro Tyr Val Leu Pro Gly Phe Val Ala Gly Ser				

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Thr Ile Leu Asp Ala Asp Gly Ala Gly Val Thr Val Ser Ala Val Phe		
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Thr Thr Leu Asp Val Val Gly Leu Thr Ile Pro Val Thr Ile Ser Asp		
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Ile Lys Ile Ala Pro Trp Gly Met Phe Ala Phe Ala Gly Lys Lys Ser		
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Pro Phe Gly Asp Val Phe Pro Asn Lys Lys Arg Gly Asn Ala Trp Trp		
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Val Gly Leu Ser Ala Glu Leu Ala Gly Ser Ser Pro Leu His Ile Ala		
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Val Asp Gly Ala Tyr Gly Arg Ala Asp Leu Gly Ser Leu Arg Asn Val		
260	265	270
Val Ile Gly Asp Phe Leu Leu Asp Lys Ile Asp Leu Lys Arg Gln Gly		
275	280	285
Trp Tyr Ala Ala Leu Leu Ala Glu Tyr Lys Phe Glu Tyr Val Thr Pro		
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Gly Val Ile Gly Trp Tyr Ala Ser Gly Asp Lys Val Asp Ser Arg Gly		
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Ala Ser Lys Arg Ile Pro Thr Leu Val Gly Asn Trp Ser Ala Thr Ser		
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Phe Gly Tyr Ser Gly Ala Tyr Gly Ile Gly Lys Asp Ser Val Phe Gly		
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Lys Lys Asp Tyr Ala Trp Glu Val Asp Phe Asp Thr Glu Tyr Lys Ile		
420	425	430
Tyr Lys Asp Leu Ser Val Ala Leu Glu Leu Ser Tyr Ile Arg Leu Glu		
435	440	445
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# SEQUENCE LISTING

<110> JACOBS, Antonius A.C.  
VERMEIJ, Paul

<120> LAWSONIA INTRACELLULARIS VACCINE

<130> JACOBS ET AL.

<140> To be assigned

<141> 2001-12-20

<150> EP00204660.5

<151> 2000-12-20

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Leu Val Asp Tyr Ser Gly Ser Met Met Met Lys His Val Ala Val Arg	
20 25 30	

gag cct aaa ata gaa tta gca aaa gaa gct ata tta aaa att aat gcg	144
Glu Pro Lys Ile Glu Leu Ala Lys Glu Ala Ile Leu Lys Ile Asn Ala	
35 40 45	

gca atg cct aaa atg tca tat caa ggt gga tta tat act ttt gca cct	192
Ala Met Pro Lys Met Ser Tyr Gln Gly Gly Leu Tyr Thr Phe Ala Pro	
50 55 60	

tat tct gta att att ccc caa ggt tct tgg aat tca tgt gtt gcc gaa	240
Tyr Ser Val Ile Ile Pro Gln Gly Ser Trp Asn Ser Cys Val Ala Glu	
65 70 75 80	



tgt gcg gtt aat aca att aag tct gat tta gaa att ttt ggt cgt ctt	288
Cys Ala Val Asn Thr Ile Lys Ser Asp Leu Glu Ile Phe Gly Arg Leu	
85 90 95	

act cct gtg gga gac ggc ata aaa atg cat gaa aca gtc att aat caa	336
Thr Pro Val Gly Asp Gly Ile Lys Met His Glu Thr Val Ile Asn Gln	
100 105 110	

atg ccc cct cag gca gcc gtt att ctt ctc act gat ggt cat aat aat	384
Met Pro Pro Gln Ala Ala Val Ile Leu Leu Thr Asp Gly His Asn Asn	
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cct aat gtt tgt ttt cat gta gtt tca ttt gca gat gat gct gaa ggc	480
Pro Asn Val Cys Phe His Val Val Ser Phe Ala Asp Asp Ala Glu Gly	
145 150 155 160	

aaa gca ata att gat caa att gtt gca ctt aat agt gga agt gtt ctt	528
Lys Ala Ile Ile Asp Gln Ile Val Ala Leu Asn Ser Gly Ser Val Leu	
165 170 175	

gtt gat ggt tta cag ctt cta caa aat cct gct gtt tgc caa gaa ttt	576
Val Asp Gly Leu Gln Leu Leu Gln Asn Pro Ala Val Cys Gln Glu Phe	
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gtt aat agt gtt ttt tgt caa gag caa att ctt gtt aca gaa gaa gtt	624
Val Asn Ser Val Phe Cys Gln Glu Gln Ile Leu Val Thr Glu Glu Val	
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Lys Gln Arg Leu Arg Thr Gln Ile Asp Ile Val Ala Ser Glu Ser Leu	
35 40 45	
aag ggt gtt gta ttc ttt gaa tta ggt aag act atc tgg gga cgt ggt	192
Lys Gly Val Val Phe Phe Glu Leu Gly Lys Thr Ile Trp Gly Arg Gly	
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Val Asp Gly Ala Ser Ile Gly Thr Asp Gly Lys Asn Val Ile Lys Leu	
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cgt tat tcc tat gtt gat tgg gtt att cct tac aca gat gtg caa gtc	288
Arg Tyr Ser Tyr Val Asp Trp Val Ile Pro Tyr Thr Asp Val Gln Val	
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Arg Met Gly Leu Gln Pro Tyr Val Leu Pro Gly Phe Val Ala Gly Ser	
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Thr Ile Leu Asp Ala Asp Gly Ala Gly Val Thr Val Ser Ala Val Phe	
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aat gat tat tta ggt gct aca gct ttc tgg atg cgt gca ttg cat aaa	432
Asn Asp Tyr Leu Gly Ala Thr Ala Phe Trp Met Arg Ala Leu His Lys	
130 135 140	
aac tat gat agt aat tat gga ata tca aag cta cct aac ttt aaa ggt	480
Asn Tyr Asp Ser Asn Tyr Gly Ile Ser Lys Leu Pro Asn Phe Lys Gly	
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aca aca tta gat gta gtt gga tta act att cct gta aca ata tct gat	528
Thr Thr Leu Asp Val Val Gly Leu Thr Ile Pro Val Thr Ile Ser Asp	
165 170 175	
ata aaa att gct cca tgg ggt atg ttt gct ttt gca ggt aag aag agc	576
Ile Lys Ile Ala Pro Trp Gly Met Phe Ala Phe Ala Gly Lys Lys Ser	

180	185	190	
tta tta ggg gaa agc tat gga gat att gaa gat gta aga gca ggt ctt			624
Leu Leu Gly Glu Ser Tyr Gly Asp Ile Glu Asp Val Arg Ala Gly Leu			
195	200	205	
tta cca gca atg cca gca gga ttt gga tat agc tgg gga gct ggt aat			672
Leu Pro Ala Met Pro Ala Gly Phe Gly Tyr Ser Trp Gly Ala Gly Asn			
210	215	220	
cca ttt gga gat gtt ttt cca aat aaa aag cgt ggt aat gca tgg tgg			720
Pro Phe Gly Asp Val Phe Pro Asn Lys Lys Arg Gly Asn Ala Trp Trp			
225	230	235	240
gtt ggt tta tca gct gaa ctt gct ggc tca agt cct ttg cat ata gct			768
Val Gly Leu Ser Ala Glu Leu Ala Gly Ser Ser Pro Leu His Ile Ala			
245	250	255	
gtt gat ggt gct tat gga cga gca gac tta gga agt ctt aga aat gtt			816
Val Asp Gly Ala Tyr Gly Arg Ala Asp Leu Gly Ser Leu Arg Asn Val			
260	265	270	
gtt att ggt gac ttc tta cta gat aag att gat tta aaa cgt caa ggt			864
Val Ile Gly Asp Phe Leu Leu Asp Lys Ile Asp Leu Lys Arg Gln Gly			
275	280	285	
tgg tat gca gca tta tta gca gaa tat aaa ttt gaa tat gta act cca			912
Trp Tyr Ala Ala Leu Leu Ala Glu Tyr Lys Phe Glu Tyr Val Thr Pro			
290	295	300	
ggg gtt ata ggt tgg tat gcc tca gga gat aaa gtt gat tca cgt ggc			960
Gly Val Ile Gly Trp Tyr Ala Ser Gly Asp Lys Val Asp Ser Arg Gly			
305	310	315	320
gcc tct aaa aga ata cca aca tta gtt gga aac tgg tca gca aca agt			1008
Ala Ser Lys Arg Ile Pro Thr Leu Val Gly Asn Trp Ser Ala Thr Ser			
325	330	335	
ttt gga tat agt gga gcc tat ggt ata ggc aaa gat tct gtt ttt gga			1056
Phe Gly Tyr Ser Gly Ala Tyr Gly Ile Gly Lys Asp Ser Val Phe Gly			
340	345	350	
aat act att gct ggc tca tgg ggt gtt gta gtt cag ttg aaa gat att			1104
Asn Thr Ile Ala Gly Ser Trp Gly Val Val Val Gln Leu Lys Asp Ile			
355	360	365	
tct ttc tta gaa aat cta act cat ggt atc cgt gga gct aga att cag			1152
Ser Phe Leu Glu Asn Leu Thr His Gly Ile Arg Gly Ala Arg Ile Gln			

370	375	380	
ggt aca aat aat aaa gac gtt cct gaa cac tta ggt tta tca tac gtt			1200
Gly Thr Asn Asn Lys Asp Val Pro Glu His Leu Gly Leu Ser Tyr Val			
385	390	395	400
act acc att tat gac aca cgt ggt ggt gat aat atg ctt tac tta aca			1248
Thr Thr Ile Tyr Asp Thr Arg Gly Gly Asp Asn Met Leu Tyr Leu Thr			
	405	410	415
aag aaa gat tat gct tgg gaa gta gat ttt gat act gaa tat aaa atc			1296
Lys Lys Asp Tyr Ala Trp Glu Val Asp Phe Asp Thr Glu Tyr Lys Ile			
	420	425	430
tat aaa gac tta agt gta gct ctt gaa ctg tca tat att cgt ctt gaa			1344
Tyr Lys Asp Leu Ser Val Ala Leu Glu Leu Ser Tyr Ile Arg Leu Glu			
	435	440	445
ctt gat aaa aaa cta tgg aac ctt caa aga gaa gtt gat aag aat gcc			1392
Leu Asp Lys Lys Leu Trp Asn Leu Gln Arg Glu Val Asp Lys Asn Ala			
	450	455	460
tat cgt gct ggt tta aat atg aag tat caa ttc taa			1428
Tyr Arg Ala Gly Leu Asn Met Lys Tyr Gln Phe			
465	470	475	

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Gln	Gln	Ser	Ser	Phe	Met	Lys	Gly	Asp	Gly	Asp	Gln	Arg	Phe	Ser	Pro
			20					25					30		

Lys	Gln	Arg	Leu	Arg	Thr	Gln	Ile	Asp	Ile	Val	Ala	Ser	Glu	Ser	Leu
			35				40					45			

Lys	Gly	Val	Val	Phe	Phe	Glu	Leu	Gly	Lys	Thr	Ile	Trp	Gly	Arg	Gly
	50					55				60					

Val	Asp	Gly	Ala	Ser	Ile	Gly	Thr	Asp	Gly	Lys	Asn	Val	Ile	Lys	Leu
65					70					75					80

Arg	Tyr	Ser	Tyr	Val	Asp	Trp	Val	Ile	Pro	Tyr	Thr	Asp	Val	Gln	Val	85	90	95
Arg	Met	Gly	Leu	Gln	Pro	Tyr	Val	Leu	Pro	Gly	Phe	Val	Ala	Gly	Ser	100	105	110
Thr	Ile	Leu	Asp	Ala	Asp	Gly	Ala	Gly	Val	Thr	Val	Ser	Ala	Val	Phe	115	120	125
Asn	Asp	Tyr	Leu	Gly	Ala	Thr	Ala	Phe	Trp	Met	Arg	Ala	Leu	His	Lys	130	135	140
Asn	Tyr	Asp	Ser	Asn	Tyr	Gly	Ile	Ser	Lys	Leu	Pro	Asn	Phe	Lys	Gly	145	150	155
Thr	Thr	Leu	Asp	Val	Val	Gly	Leu	Thr	Ile	Pro	Val	Thr	Ile	Ser	Asp	165	170	175
Ile	Lys	Ile	Ala	Pro	Trp	Gly	Met	Phe	Ala	Phe	Ala	Gly	Lys	Lys	Ser	180	185	190
Leu	Leu	Gly	Glu	Ser	Tyr	Gly	Asp	Ile	Glu	Asp	Val	Arg	Ala	Gly	Leu	195	200	205
Leu	Pro	Ala	Met	Pro	Ala	Gly	Phe	Gly	Tyr	Ser	Trp	Gly	Ala	Gly	Asn	210	215	220
Pro	Phe	Gly	Asp	Val	Phe	Pro	Asn	Lys	Lys	Arg	Gly	Asn	Ala	Trp	Trp	225	230	235
Val	Gly	Leu	Ser	Ala	Glu	Leu	Ala	Gly	Ser	Ser	Pro	Leu	His	Ile	Ala	245	250	255
Val	Asp	Gly	Ala	Tyr	Gly	Arg	Ala	Asp	Leu	Gly	Ser	Leu	Arg	Asn	Val	260	265	270
Val	Ile	Gly	Asp	Phe	Leu	Leu	Asp	Lys	Ile	Asp	Leu	Lys	Arg	Gln	Gly	275	280	285
Trp	Tyr	Ala	Ala	Leu	Leu	Ala	Glu	Tyr	Lys	Phe	Glu	Tyr	Val	Thr	Pro	290	295	300
Gly	Val	Ile	Gly	Trp	Tyr	Ala	Ser	Gly	Asp	Lys	Val	Asp	Ser	Arg	Gly	305	310	315
Ala	Ser	Lys	Arg	Ile	Pro	Thr	Leu	Val	Gly	Asn	Trp	Ser	Ala	Thr	Ser	325	330	335

Phe Gly Tyr Ser Gly Ala Tyr Gly Ile Gly Lys Asp Ser Val Phe Gly  
 340 345 350

Asn Thr Ile Ala Gly Ser Trp Gly Val Val Val Gln Leu Lys Asp Ile  
 355 360 365

Ser Phe Leu Glu Asn Leu Thr His Gly Ile Arg Gly Ala Arg Ile Gln  
 370 375 380

Gly Thr Asn Asn Lys Asp Val Pro Glu His Leu Gly Leu Ser Tyr Val  
 385 390 395 400

Thr Thr Ile Tyr Asp Thr Arg Gly Gly Asp Asn Met Leu Tyr Leu Thr  
 405 410 415

Lys Lys Asp Tyr Ala Trp Glu Val Asp Phe Asp Thr Glu Tyr Lys Ile  
 420 425 430

Tyr Lys Asp Leu Ser Val Ala Leu Glu Leu Ser Tyr Ile Arg Leu Glu  
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Leu Asp Lys Lys Leu Trp Asn Leu Gln Arg Glu Val Asp Lys Asn Ala  
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Gly Thr Gln Glu Tyr Asn Leu Ala Leu Gly Glu Arg  
1 5 10